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ABSTRACT

This final study in a series reports the investigation in detail of the sex-related differences in the mathematics achievement of sixth grade students. Students were stratified in four intelligence levels with 91.5, 101.5, and 111.5 IQ as cutpoints. Twenty computation scores and eight contemporary mathematics scores were derived from the California Arithmetic Test and the California Mathematics Test administered to 951 students in three programs: 1965 traditional, 1965 new math (SMSG), and 1975 modern. A summary of results indicates that sex-related differences were least likely to occur at the highest intelligence level and most likely to occur at mid-intelligence levels. Many small but statistically significant differences favored the girls almost exclusively in computation. The few statistically significant differences favoring the boys occurred in fraction division and in two contemporary mathematics variables: number-systems-and-properties, and graphs. Cross-program sex comparisons suggested the influence of the program in emphasizing or counteracting the expected (within program pattern) as sex-related differences. (Author)

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Sex, IQ And Program-Studied As Factors In Mathematics Achievement, Grade Six

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This report, culminating a decade of research in the mathematics achievement of sixth grade students, focuses upon the influence of sex, IQ and program-studied as factors in mathematics learning.[1]

Conceptual Framework

In the continuing controversy concerning sex-related differences and mathematics performance reviewers and researchers disagree about the existence of such differences as well as the more specialized areas in which these may occur. There are fewer studies of elementary students than of secondary students and adults, and results are often reported only for overall performance or a small number of subscores. In 1974, Maccoby and Jacklin stated as "fairly well established" the generalization that "boys excel in mathematical ability," but immediately qualified this with the subsequent statement, "The two sexes are similar in the early acquisition of quantified concepts, and their mastery of arithmetic during the grade-school years." (p. 352)

[1]Earlier reports can be found in, "Research Sections, National Council of Teachers of Mathematics 55th Annual Meeting, Cincinnati, Ohio, April, 1977," ERIC-SMEAC: Ohio State University, Columbus, Ohio; and in ERIC:ED 144839.

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In a 1977 NIE publication, Fox mentions grade seven as "the age at which sex differences on achievement measures are typically first found," but adds they "quite likely actually develop far earlier...This does not appear to have been researched." (p. 43) Fennema (1977) references herself in that same NIE publication as having reviewed 36 studies in 1974 and having concluded "that there were no sex-related differences in elementary school children's mathematics achievement." (p. 81) Asking what can be concluded about sex-related differences in mathematics learning in 1976, she answers, "There are no sex-related differences evident in elementary school years. This is at all cognitive levels from computation to problem-solving. This conclusion has been accepted for a number of years." (1977, p. 85) In 1980 Fennema (Note 1) cited a California State Department of Education study as concluding that in grade six, girls do better than boys in computation with whole numbers, fractions and decimals, while boys were higher on word- or multi-step problems and reasoning. National Assessment results from the second mathematics assessment are described in the ECS 1979 report: "At ages 9 and 13 there were no differences between overall average males' and females' performance...Nine-year-old males did slightly better than females on application items." (p. 21) An NAEP newsletter, April, 1980, states, "Among 13-year-olds... females' mathematical abilities are comparable and in some areas, superior to those of males." (p. 1)

Michigan Assessment results for the 1979-80 year indicated that girls' performance led boys' significantly in both math and reading in the fourth and seventh grades. (Teare, 1980) In none of the literature reviewed was intelligence level or program-studied reported as a variable in investigating sex-related differences in the mathematics performance of elementary grade students.

Purpose And Design

The purpose of this final study was to investigate in detail the sex-related differences, if any, in the mathematics achievement of sixth grade students, and to determine whether these differences were consistent across intelligence levels and mathematics-program-studied. Data collected in earlier studies included total and subscores for the California Arithmetic Test and the California Contemporary Mathematics Test which were administered by the researcher in late Spring, 1965 and 1975, to sixth grade students. The two 1965 groups, traditional and new math (School Mathematics Study Group), were given both tests, while the 1975 modern group was given only the California Arithemtic Test (permission could be obtained for only one session). There were 951 students in the three programs, stratified into four intelligence levels with 91.5, 101.5, and 111.5 used as IQ cutpoints (see Table 1). ANOVA and pairwise comparisons with Scheffe allowances were run for each subgroup on each of the 28 variables: 20 computation and 8 contemporary mathematics. Each sex subgroup was compared with the opposite

sex subgroup at the same intelligence level, within the same program-studied, then with the opposite sex subgroup at the same intelligence level in two other programs-studied.

Findings

1. For within program comparisons, sex-related differences are least likely to occur at the highest IQ ($\geq$ 112) level.
2. Within program comparisons (240) on computational variables (20) demonstrated that females were superior 27 times, 14 of which were in whole numbers, 3 in fractions and 4 in decimals. Males were superior only once, in fraction division. Variables that discriminated most often were whole number total (5) and whole number subtraction (4). (see Table 2)
3. Within program comparisons (64) on contemporary mathematics variables (8) demonstrated that males were superior 3 times: in graphs (2) and number systems and properties (1). Females were superior in none of these comparisons. (see Table 3)
4. These differences are not large, but are statistically, significant ranging from $P < .0000$ to $P < .05$.
5. These differences occurred with program and intelligence level controlled, which produced remarkably similar performance (significance level of .70 or higher, up to one instance of 1.00) in many of the comparisons: 64/240 in computation, and 22/64 in contemporary mathematics. The variables with highest incidence of "similar" scores (5)

were: fraction addition, fraction multiplication, fraction total, decimal addition, decimal multiplication, and geometry. (see Tables 2 and 3)

6. In cross-program comparisons (40), on 20 computational variables, 1965 SMSG females outscored 1965 traditional males significantly 17 times, including 3 whole number variables at the lowest IQ level. 1965 traditional males were superior on 1 whole number and 3 fraction variables, also in computation total, substraction and division, none of these at either the lowest or the highest IQ levels. (see Table 4)

7. In cross-program comparisons (32) on 8 contemporary mathematics variables, 1965 SMSG females outscored 1965 traditional males 16 times: twice or three times on every variable except measurement and graphs. Most differences (6) occurred at the highest IQ level, while only one occurred at the lowest IQ level. (see Table 5)

8. In cross-program comparisons (40), on 20 computational variables, 1965 traditional females outscored 1965 SMSG males significantly 26 times: in 12 whole number variables and 6 fraction variables as well as computation total, addition, subtraction and division, with most of these occurring at the midlow and midhigh IQ levels. In whole number division and fraction subtraction the 1965 traditional female superiority occurred at all four IQ levels. The 1965 SMSG males outscored the 1965 traditional females 7

times: twice in fraction division, three times in decimal subtraction and once each in decimal multiplication and decimal total. Most of these differences (4) occurred at the highest IQ level. (see Table 4)

9. In cross-program (32) comparisons on 8 contemporary mathematics variables the 1965 SMSG males outscored the 1965 traditional females 17 times: at all four IQ levels on number systems and properties, at all but the lowest IQ level on total score, new symbolism & vocabulary, and old symbolism & vocabulary, twice on geometry, once each on base ten numeration and graphs, but not at all on measurement. (see Table 5)

10. In cross-years and cross-programs comparisons (80), on 20 computational variables, the 1975 modern females outscored the 1965 SMSG males significantly 15 times: 9 in whole numbers, 3 in decimals, once each in computation total, subtraction and multiplication, and not at all in fractions. Ten of these 15 differences were at the midhigh IQ level. The 1965 SMSG males were significantly superior 6 times, all at the highest IQ level: three times in decimals, once each in addition, subtraction, and fraction subtraction. (see Table 6)

11. In cross-years and cross program comparisons (80), on 20 computational variables, the 1965 SMSG females outscored the 1975 modern males 16 times, mostly at the highest IQ and midlow IQ levels. These differences occurred 6 times in fractions three times in decimals, once in whole numbers

and five times in computation & operation totals. The 1975 modern males were significantly superior to the 1965 SMSG females three times: division, fraction division and decimal division. (see Table 6)

A summary of the results indicates that with program-studied controlled, sex-related differences were least likely to occur at the highest intelligence level (IQ of 112 or higher) and most likely to occur at mid-intelligence levels. Many small but statistically significant differences favored the girls almost exclusively in traditional computation. The few statistically significant differences favoring the boys occurred in fraction division, and in two contemporary mathematics variables: number-systems-and-properties, and graphs. An unexpected and rather dramatic finding was the degree of similarity sometimes evident in these within-program pairwise comparisons; significance levels ranged from 170 to as high as .98 and .99. These striking similarities provide a contrast which adds real meaning to the differences which did occur. Cross-program sex comparisons suggested the influence of the program in emphasizing or counteracting some of the sex-related differences which were apparent in the within-program comparisons.

Discussion

The sex-related trend of females' superiority in computation, mostly in whole numbers, but also somewhat in fractions and decimals, may be due to developmental advantage at that age. It

may with equal logic be attributed to the psychological syndrome of "pleasing the teacher" which is the way behavior of girls in the elementary grades has often been characterized. Girls may simply be performing up to their full potential more than boys at this age. To explain the less successful female performance in the contemporary mathematics variables and in the difficult variable of fraction division simply by a mental or physiological superiority of males cannot be supported because of the conflicting evidence in the cross-program comparisons. Girls in a contemporary mathematics program outscored traditional boys on some of these variables. Boys in a traditional program outscored contemporary math girls on some computational variables. Programs' relative strengths were evident: fractions for the traditional group, decimals and number-systems-and-properties for the new math (SMSG) group, and whole number computation for the modern, ten-year-later group. Sex-related differences then, must be viewed with care and caution. Seen realistically they are the product of physical and mental development, psychological environment and program emphases, all in a complex combination.

Conclusion

Both intelligence and program-studied appear to be influencing variables on sex-related differences in mathematics achievement at the sixth grade level. The generalized superiority of girls in computation was supported, but their superiority in contemporary mathematics variables was evident when compared with

traditionally-taught boys. Boys excelled in few variables, but these were more difficult areas such as fraction division. Traditionally-taught boys excelled in the computation area however, when compared with contemporary mathematics-taught girls. Thus it is evident that these variables of intelligence and program-studied combine in their influence upon mathematics learning and should not be considered separately. The final conclusion, based upon the most consistent data trend, is that girls and boys at the highest intelligence level are most similar in their mathematics performance. When program-studied was controlled, influencing variables investigated in this study discriminated the sexes at this intelligence level only once in a total of 76 comparisons.

REFERENCE NOTES

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Table 1

SAMPLE POPULATION DESCRIPTION
SEX-INTELLIGENCE SUBGROUPS

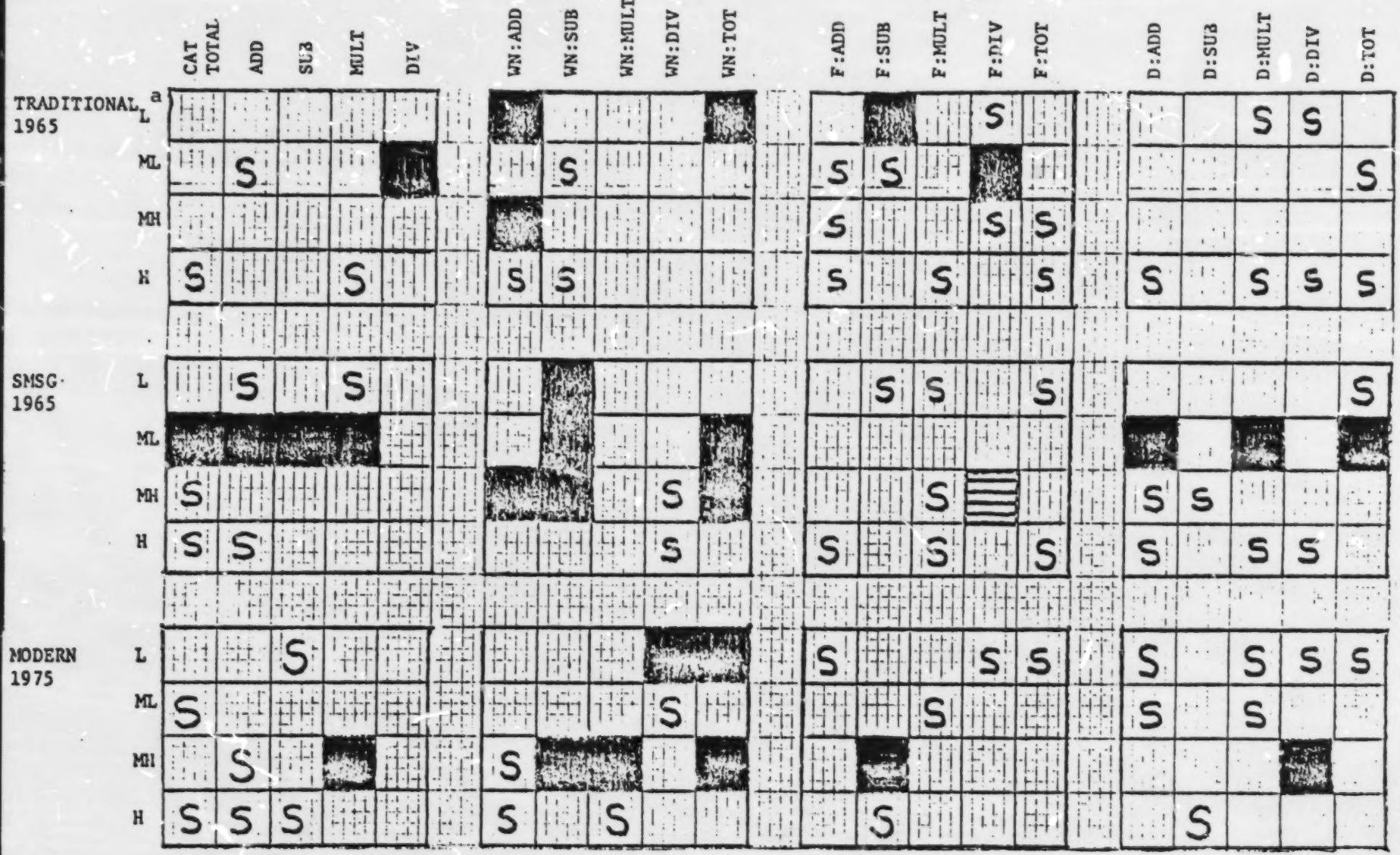
PROGRAM	I.Q. LEVEL	MALE	FEMALE	TOTAL
1965	Low < 92	23	12	35
Traditional	Midlow 92-101	26	30	56
	Midhigh 102-111	35	29	64
	High ≥ 112	51	54	105
		135	125	260
1965	Low	43	33	76
SMSG (School Math.	Midlow	37	34	71
Study Group)	Midhigh	29	28	57
	High	48	53	101
		157	148	305
1975	Low	36	39	75
Modern	Midlow	36	53	89
	Midhigh	64	63	127
	High	46	49	95
		182	204	386

CROSS-PROGRAM, YEARS COMPARISONS

	MALE	FEMALE	TOTAL
1965 TRAD MALES - 1965 SMSG FEMALES			
Low	23	33	56
Midlow	26	34	60
Midhigh	35	28	63
High	51	53	104
	135	148	283
1965 SMSG MALES - 1965 TRAD FEMALES			
Low	43	12	55
Midlow	37	30	67
Midhigh	29	29	58
High	48	54	102
	157	125	282
1965 SMSG MALES - 1975 MODERN FEMALES			
Low	43	39	82
Midlow	37	53	90
Midhigh	29	63	92
High	48	49	97
	157	204	361
1975 MODERN MALES - 1965 SMSG FEMALES			
Low	36	33	69
Midlow	36	34	70
Midhigh	64	28	92
High	46	53	99
	182	148	330

Table 2

SEX SUBGROUP COMPARISONS WITHIN THREE GROUPS, TRADITIONAL, SMSG AND MODERN, AT FOUR I Q LEVELS, FOR 20 COMPUTATIONAL VARIABLES.



NOTE. Statistically significant difference favors Boys. Statistically significant difference favors Girls. Difference is not statistically significant. Statistical significance .70 or higher; groups are extremely similar.

[a] LOW: I.Q. 91 or lower; MIDLOW: I.Q. 92 - 101; MIDHIGH: I.Q. 102-111; HIGH: I.Q. 112 or higher

Table 2 cont

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
Traditional								
Low IQ								
M	WN:A	4.87	1.66					
F	(7)	6.17	.72	-1.30	6.61	.0149*	1.0267*	1.3794
M	WN:T	18.17	6.47					
F	(33)	22.83	5.56	-4.66	4.48	.0419*	4.4785*	6.0167
M	F:S	2.57	1.47					
F	(7)	3.75	1.91	-1.18	4.16	.0496*	1.1825*	1.5886
Midlow IQ								
M	DIV	8.00	2.45					
F	(20)	10.17	2.44	-2.17	10.96	.0017*	1.3121*	1.7474*
M	F:D	1.38	1.33					
F	(8)	2.20	1.56	- .82	4.35	.0417*	.78379*	1.0438
Midhigh IQ								
M	WN:A	6.11	1.21					
F	(7)	6.66	.48	- .54	5.13	.0270*	.47745*	.63473
High IQ		No stat. sig. differences						
SMSG								
Low IQ								
M	WN:S	4.93	1.64					
F	(7)	5.79	1.27	- .86	6.62	.0151*	.68712*	.91174
Midlow IQ								
M	CAT:T	37.92	8.04					
F	(80)	44.38	10.86	-6.46	8.21	.0055*	4.4993*	5.9744*
M	ADD	11.32	2.51					
F	(20)	12.82	3.49	-1.50	4.37	.0403*	1.4310*	1.9001
M	SUB	10.03	3.31					
F	(20)	12.06	3.43	-2.03	6.45	.0134*	1.5964*	2.1197
M	MULT	8.62	2.75					
F	(20)	10.38	3.85	-1.76	4.98	.0289*	1.5737*	2.0896
M	WN:S	5.16	1.59					
F	(7)	6.18	1.03	-1.01	9.99	.0023*	.64036*	.85030*
M	WN:T	23.40	4.11					
F	(33)	25.74	3.82	-2.33	5.09	.0161*	1.8833*	2.5007

Table 2 cont.

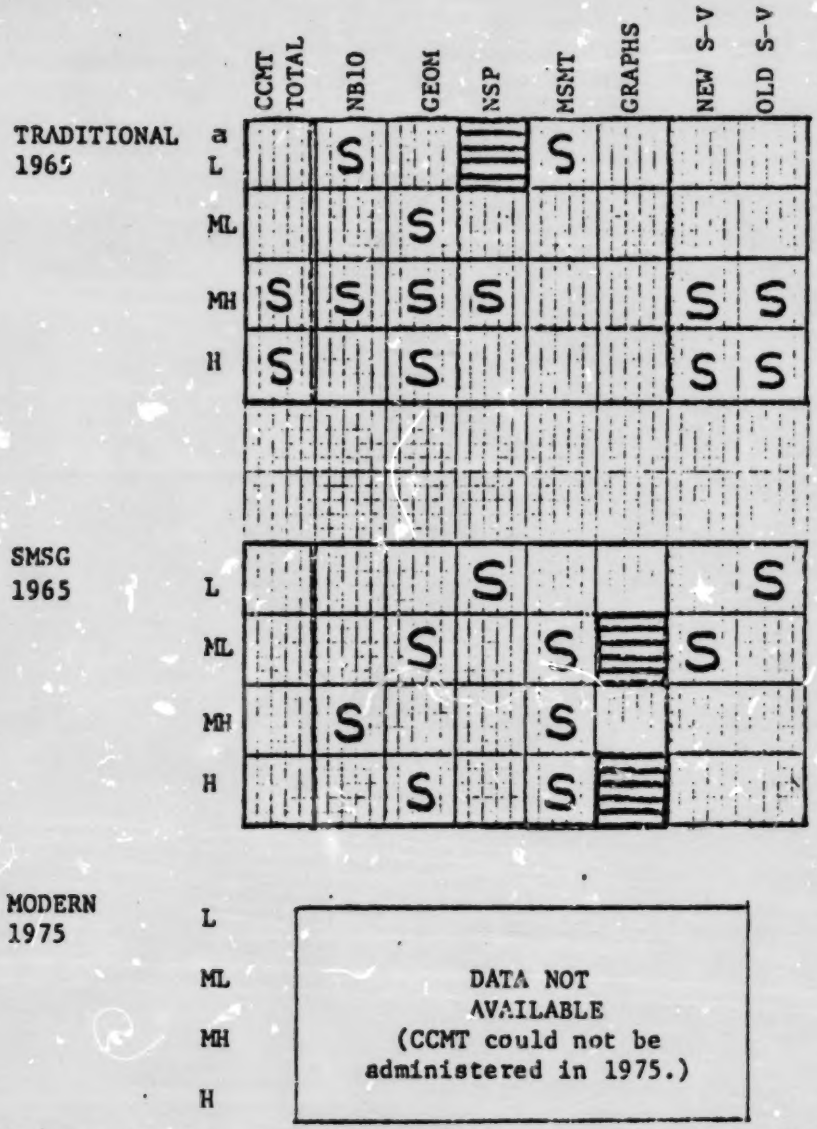
Group	Variable, Item N	Means	S.D.	Diff.	F	Sig	Scheffe 9500	Scheffe 9900
M	D:A	.41	.64					
F	(2)	.79	.77	- .39	5.36	.0236*	.33502*	.44485
M	D:M	.49	.59					
F	(2)	.88	.64	- .40	7.73	.0070*	.28398	.33708*
M	D:T	1.78	1.36					
F	(8)	2.74	1.62	- .95	7.24	.0089*	.70548*	.93676*
Midhigh IQ								
M	WN:A	5.90	1.45					
F	(7)	6.54	.88	- .64	4.02	.0499*	.63898*	.85075
M	WN:S	5.48	1.70					
F	(7)	6.43	.74	- .95	7.29	.0092*	.70185*	.93445*
M	WN:T	23.62	5.67					
F	(33)	26.21	3.41	-2.59	4.34	.0420*	2.4961*	3.3234
M	F:D	3.03	2.03	1.46				
F	(8)	1.57	1.29		10.49	.0020*	.90512*	1.2051*
High IQ		No stat. sig. differences						
Modern								
Low IQ								
M	WN:D	4.50	2.20					
F	(10)	5.59	2.22	-1.09	4.55	.0362*	1.0178*	1.3508
M	WN:T	20.31	5.18					
F	(33)	22.62	4.56	-2.310	4.22	.0436*	2.2417*	2.9749
Midlow IQ		No stat. sig. differences						
Midhigh IQ								
M	MULT	9.83	2.91					
F	(20)	11.13	2.67	-1.30	6.87	.0098*	.98053*	1.2959*
M	WN:S	6.08	1.07					
F	(7)	6.48	.76	- .40	5.81	.0174*	.32698*	4.3216
M	WN:M	6.84	1.58					
F	(9)	7.63	1.08	- .79	10.85	.0013*	.47546*	.62840*
M	WN:T	26.58	3.19					
F	(33)	28.14	2.73	-1.56	8.79	.0036*	1.0445*	1.3805*
M	F:S	3.50	1.61					
F	(7)	4.11	1.45	- .61	5.04	.0266*	.53889*	.71223

Table 2 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
M	D:D	.64	.57					
F	(2)	.89	.74	- .25	4.45	.0369*	.23290*	.30782
High IQ		No stat. sig. differences						

Table 3

SEX SUBGROUP COMPARISONS WITHIN THREE GROUPS, TRADITIONAL, SMSG AND MODERN, AT FOUR I Q LEVELS, FOR 8 CONTEMPORARY MATHEMATICS VARIABLES.



CCMT - California Contemporary Mathematics Test
NB10 - Numeration, Base 10
GEOM - Geometry
NSP - Number Systems and Properties
MSMT - Measurement
GRAPHS - Graphs
NEW S-V - New Symbolism and Vocabulary
OLD S-V - Traditional Symbolism and Vocabulary

NOTE. Statistically significant difference favors Boys. Statistically significant difference favors Girls. Difference is not statistically significant. S Statistical significance .70 or higher; groups are extremely similar.

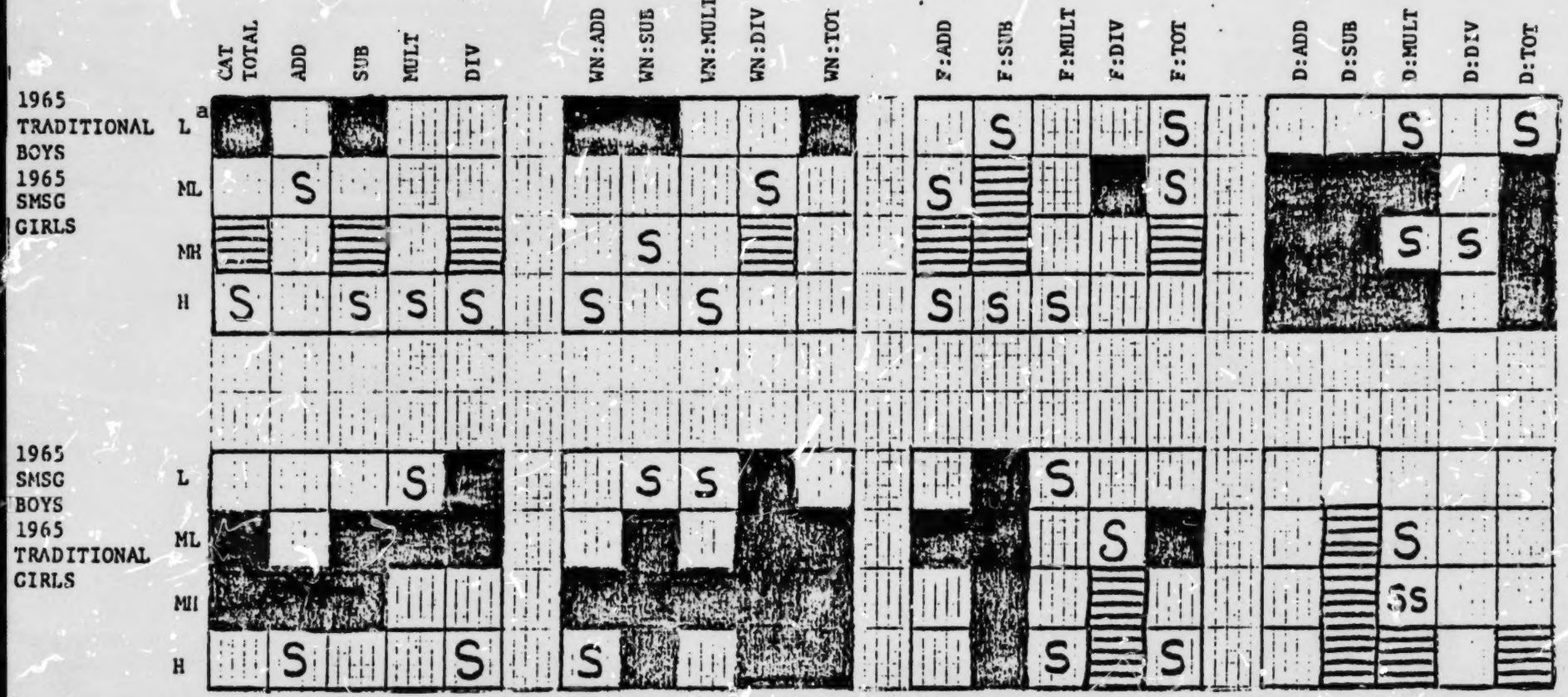
[a] LOW: I.Q. 91 or lower; MIDLOW: I.Q. 92 - 101; MIDHIGH: I.Q. 102-111; HIGH: I.Q. 112 or higher

Table 3 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
Traditional								
Low IQ								
M	NSP	5.48	1.53	1.56	7.86	.0084*	1.1327*	1.5217*
F	(23)	3.92	.62					
Midlow IQ		No stat. sig. difference						
Midhigh IQ		No stat. sig. difference						
High IQ		No stat. sig. differences						
SMSG								
Low IQ		No stat. sig. differences						
Midlow IQ								
M	Graphs	2.16	.65	.37				
F	(3)	1.79	.69		5.41	.0229*	.31554*	.41899
Midhigh IQ		No stat. sig. differences						
High IQ								
M	Graphs	2.69	.71	.27	4.72	.0322*	.24872*	.32922
F	(3)	2.41	.72					

Table 4

SEX SUBGROUP COMPARISONS ACROSS PROGRAMS (TRADITIONAL AND SMSG), AT FOUR I Q LEVELS, FOR 20 COMPUTATIONAL VARIABLES.



NOTE. ▤ Statistically significant difference favors Boys ■ Statistically significant difference favors Girls □ Difference is not statistically significant [S] Statistical significance .70 or higher; groups are extremely similar.

[a]LOW: I.Q. 91 or lower; MIDLOW: I.Q. 92 - 101; MIDHIGH: I.Q. 102-111; HIGH: I.Q. 112 or higher

Table 4 cont.

Group	Variable Item N	Mean	S.D.	Diff.	F.	Sig.	Scheffe 9500	Scheffe 9900
SM	F:S	3.45	1.80					
TF	(7)	5.55	1.33	-2.10	25.60	.0000*	.83282*	1.1086*
SM	F:D	3.03	2.03					
TF	(8)	2.14	1.27	.90	4.07	.0485*	.89038*	1.1852
SM	D:S	.38	.56					
TF	(2)	.03	.19	.34	9.86	.0027*	.22000*	.29284*
High IQ								
SM	WN:S	5.92	1.30					
TF	(7)	6.5[illegible]	.72	- .62	9.13	.0032*	.40728*	.53906*
SM	WN:D	7.71	1.68					
TF	(10)	8.74	1.18	-1.03	13.13	.0005*	.56527*	.74816*
SM	WN:T	27.42	4.18					
TF	(33)	29.57	2.60	-2.16	10.02	.0021*	1.3524*	1.7900*
SM	F:S	5.42	1.51					
TF	(7)	5.98	1.31	- .56	4.08	.0460*	.55470*	.73418
SM	F:D	3.65	1.99					
TF	(8)	2.83	2.01	.81	4.19	.0413*	.78760*	1.0424
SM	D:S	1.04	.82					
TF	(2)	.28	.63	.76	28.11	.0000*	.28584*	.37833*
SM	D:M	.94	.76					
TF	(2)	.61	.56	.33	6.20	.0144*	.26001*	.34414
SM	D:T	3.71	1.88					
TF	(8)	2.39	1.52	1.32	15.32	.0002*	.66877*	.88516*

Table 4 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F.	Sig.	Scheffe 9500	Scheffe 9900
TM	F:S	5.23	1.57					
SG	(7)	3.79	1.93	1.44	10.69	.0018*	.88266*	1.1737*
TM	F:T	15.49	3.84					
SG	(30)	12.14	5.89	3.34	7.37	.0086*	2.4618*	3.2734*
TM	D:A	.20	.47					
SG	(2)	.61	.83	- .41	5.99	.0173*	.33277*	.44247
TM	D:S	.11	.32					
SG	(2)	.39	.50	.28	7.20	.0094*	.20754*	.27596*
TM	D:T	1.26	1.12					
SG	(8)	1.93	1.41	- .67	4.43	.0394*	.63782*	.84810
High IQ								
TM	D:A	.73	.83					
SG	(2)	1.06	.84	- .33	4.09	.0456*	.32457*	.42953
TM	D:S	.39	.63					
SG	(2)	.92	.83	- .53	13.45	.0004*	.28791*	.38101*
TM	D:M	.65	.56					
SG	(2)	.91	.71	- .26	4.20	.0429*	.25018*	.33108
TM	D:T	2.49	1.55					
SG	(8)	3.55	1.96	-1.06	9.26	.0030*	.68900*	.91179*
SMSG/Traditional								
Low IQ								
SM	DIV	6.65	2.75					
TF	(20)	8.50	2.43	-1.85	4.44	.0398*	1.7598*	2.3442
SM	WN:D	4.51	2.42					
TF	(10)	6.17	2.25	-1.66	4.50	.0385*	1.5642*	2.0837
SM	F:S	2.56	1.64					
TF	(7)	3.75	1.91	-1.1919	4.62	.0362*	1.1121*	1.4814
Midlow IQ								
SM	CAT:T	37.92	8.04					
TF	(80)	45.27	8.19	-7.35	13.61	.0005*	3.9781*	5.2857*
SM	Sub	10.03	3.31					
TF	(20)	12.43	2.50	-2.41	10.82	.0016*	1.4611*	1.9413*
SM	MULT	8.62	2.75					
TF	(20)	10.33	2.98	-1.71	5.96	.0174	1.4003*	1.8605

Table 4 cont.

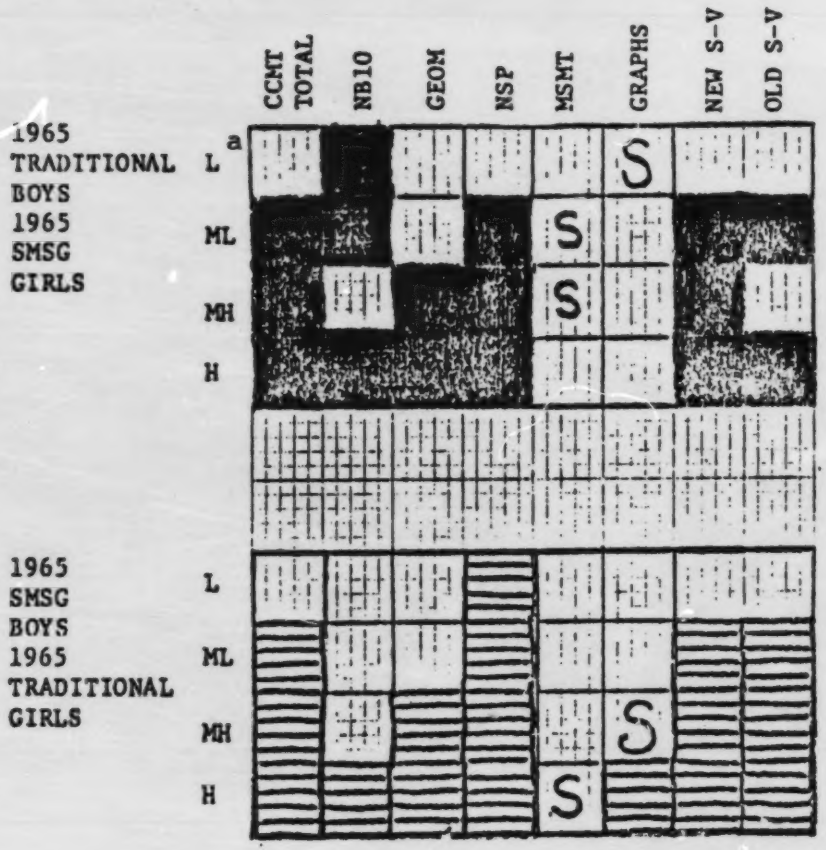
Group	Variable, Item N	Mean	S.D.	Diff.	F.	Sig.	Scheffe 9500	Scheffe 9900
SM	DIV	7.95	2.72					
TF	(20)	10.17	2.44	-2.22	12.12	.0009*	1.2738*	1.6925*
SM	WN:S	5.16	1.59					
TF	(7)	6.00	1.23	-.84	5.60	.0210*	.70719*	.93965
SM	WN:D	5.54	1.82					
TF	(10)	7.33	1.73	-1.79	16.81	.0001*	.87319*	1.1602*
SM	WN:T	23.41	4.11					
TF	(33)	26.70	4.01	-3.29	10.87	.0016*	1.9956*	2.6516*
SM	F:A	3.41	1.98					
TF	(7)	4.40	1.65	- .99	4.84	.0314*	.90293*	1.1997
SM	F:S	3.19	1.78					
TF	(7)	4.87	1.46	-1.68	17.30	.0001*	.80542*	1.0702*
SM	F:T	10.70	4.51					
TF	(30)	14.17	4.15	-3.46	10.47	.0019*	2.1378*	2.8405*
SM	D:S	.51	.69					
TF	(2)	.13	.35	.38	7.52	.0079*	.27696*	.36800*
Midhigh IQ								
SM	CAT:T	42.35	12.19					
TF	(80)	49.52	6.20	-7.17	7.98	.0065*	5.0868*	6.7711*
SM	ADD	12.00	3.76					
TF	(20)	14.41	2.06	-2.41	9.19	.0037*	1.5954*	2.123?*
SM	SUB	10.69	3.67					
TF	(20)	13.72	2.17	-3.03	14.72	.0003*	1.5845*	2.1091*
SM	WN:A	5.90	1.45					
TF	(7)	6.66	.48	- .76	7.16	.0097*	.56783*	.75584*
SM	WN:S	5.48	1.70					
TF	(7)	6.55	.74	-1.07	9.62	.0030*	.69028*	.91883*
SM	WN:M	5.90	2.27					
TF	(9)	7.62	1.08	-1.72	13.60	.0005*	.93665*	1.2468*
SM	WN:D	6.34	1.99					
TF	(10)	7.90	1.21	-1.55	12.93	.0007*	.86455*	1.1508*
SM	WN:T	23.62	5.67					
TF	(33)	28.72	2.55	-5.10	19.54	.0000*	2.3131*	3.0790*

Table 4 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
Traditional/SMSG								
Low IQ								
TM	CAT:T	30.57	9.03					
SF	(80)	35.30	7.97	-4.74	4.30	.0430*	4.5831*	6.1035
TM	SUB	7.39	2.97					
SF	(20)	9.70	2.38	-2.31	10.39	.0021*	1.4340*	1.9098*
TM	WN:A	4.87	1.66					
SF	(7)	6.15	.91	-1.28	13.85	.0005*	.6064*	.91976*
TM	WN:S	3.96	2.33					
SF	(7)	5.79	1.27	-1.83	14.40	.0004*	.96759*	1.2886*
TM	WN:T	18.17	6.47					
SF	(33)	22.82	4.50	-4.64	10.05	.0025*	2.9366*	3.9108*
Midlow IQ								
TM	F:S	4.77	1.11	.98	4.51	.0380*	.91915*	1.2229
SF	(7)	3.79	2.13					
TM	F:D	1.38	1.33					
SF	(8)	2.32	1.51	- .94	6.30	.0149*	.74885*	.99635
TM	D:A	.31	.47					
SF	(2)	.79	.77	- .49	8.06	.0062*	.34305*	.45642*
TM	D:S	.08	.27					
SF	(2)	.62	.70	- .54	13.98	.0004*	.28951*	.38520*
TM	D:M	.54	.51					
SF	(2)	.88	.64	- .34	5.06	.0284*	.30616*	.40735
TM	D:T	1.46	.95					
SF	(8)	2.74	1.62	-1.27	12.71	.0007*	.71517	.95153
Midhigh IQ								
TM	CAT:T	48.00	7.58	4.86	4.71	.0338*	4.4736*	5.9485
SG	(80)	43.14	10.17					
TM	SUB	13.46	2.48					
SG	(20)	11.82	3.17	1.64	5.28	.0250*	1.4234*	1.8926
TM	DIV	9.94	2.29					
SG	(20)	8.39	2.67	1.55	6.15	.0159*	1.2496*	1.6616
TM	WN:D	7.49	1.58					
SG	(10)	6.43	1.81	1.06	6.11	.0163*	.85529*	1.1373
TM	F:A	5.17	1.50					
SG	(7)	3.96	2.12	1.21	6.99	.0104*	.91328*	1.2144

Table 5

SEX SUBGROUP COMPARISONS ACROSS PROGRAMS (TRADITIONAL AND SMSG), AT FOUR I Q LEVELS, FOR 8 CONTEMPORARY MATHEMATICS VARIABLES.



CCMT - California Contemporary Mathematics Test
NB10 - Numeration, Base 10
GEOM - Geometry
NSP - Number Systems and Properties
MSMT - Measurement
GRAPHS - Graphs
NEW S-V - New Symbolism and Vocabulary
OLD S-V - Traditional Symbolism and Vocabulary

NOTE. ▤ Statistically significant difference favors Boys ■ Statistically significant difference favors Girls ▭ Difference is not statistically significant (S) Statistical significance .70 or higher; groups are extremely similar.

[a]LOW: I.Q. 91 or lower; MIDLOW: I.Q. 92 - 101; MIDHIGH: I.Q. 102-111; HIGH: I.Q. 112 or higher

Table 5 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
Traditional/SMSG								
Low IQ								
TM	NB10	.61	.82					
SF	(3)	1.18	1.01	- .57	4.77	.033*	.52605*	.70055
Midlow IQ								
TM	CCMT:T	9.88	3.72					
SF	(42)	13.65	3.85	-3.76	14.46	.0003*	1.9804*	2.6349*
TM	NB10	.73	.72					
SF	(3)	1.38	1.04	- .65	7.38	.0087*	.48004*	.63869*
TM	NSP	4.46	2.60					
SF	(23)	6.79	2.35	-2.33	13.28	.0006*	1.2811*	1.7045*
TM	NewS-V	4.46	2.52					
SF	(24)	6.44	2.56	-1.98	8.93	.0041*	1.3258*	1.7639*
TM	OldS-V	5.42	1.88					
SF	(18)	7.06	2.47	-1.64	7.88	.0068*	1.1666*	1.5521*
Midhigh IQ								
TM	CCMT:T	11.26	3.70					
SF	(42)	14.25	3.93	-2.99	9.62	.0029*	1.9300*	2.5662*
TM	Geom	1.34	1.19					
SF	(5)	2.36	1.28	-1.01	10.58	.0019*	.62370*	.82932*
TM	NSP	5.20	2.22					
SF	(23)	6.57	2.85	-1.37	4.62	.0356*	1.2761*	1.6968
TM	NewS-V	4.97	2.91					
SF	(24)	7.25	3.03	-2.28	9.22	.0035*	1.5004*	1.9950*
High IQ								
TM	CCMT:T	13.55	4.95					
SF	(42)	19.77	5.12	-6.22	39.75	.0000*	1.9582*	2.5915*
TM	NB10	1.39	.98					
SF	(3)	2.13	.73	- .74	19.04	.0000*	.33635*	.44512*
TM	Geom	1.75	1.25					
SF	(5)	2.57	1.32	- .82	10.59	.0015*	.50037*	.66217*
TM	NSP	6.12	2.92					
SF	(23)	10.38	2.84	-4.26	56.74	.0000*	1.1217*	1.4844*
TM	NewS-V	5.55	3.02					
SF	(24)	10.13	3.47	-4.58	51.53	.0000*	1.2664*	1.6759*

Table 5 cont.

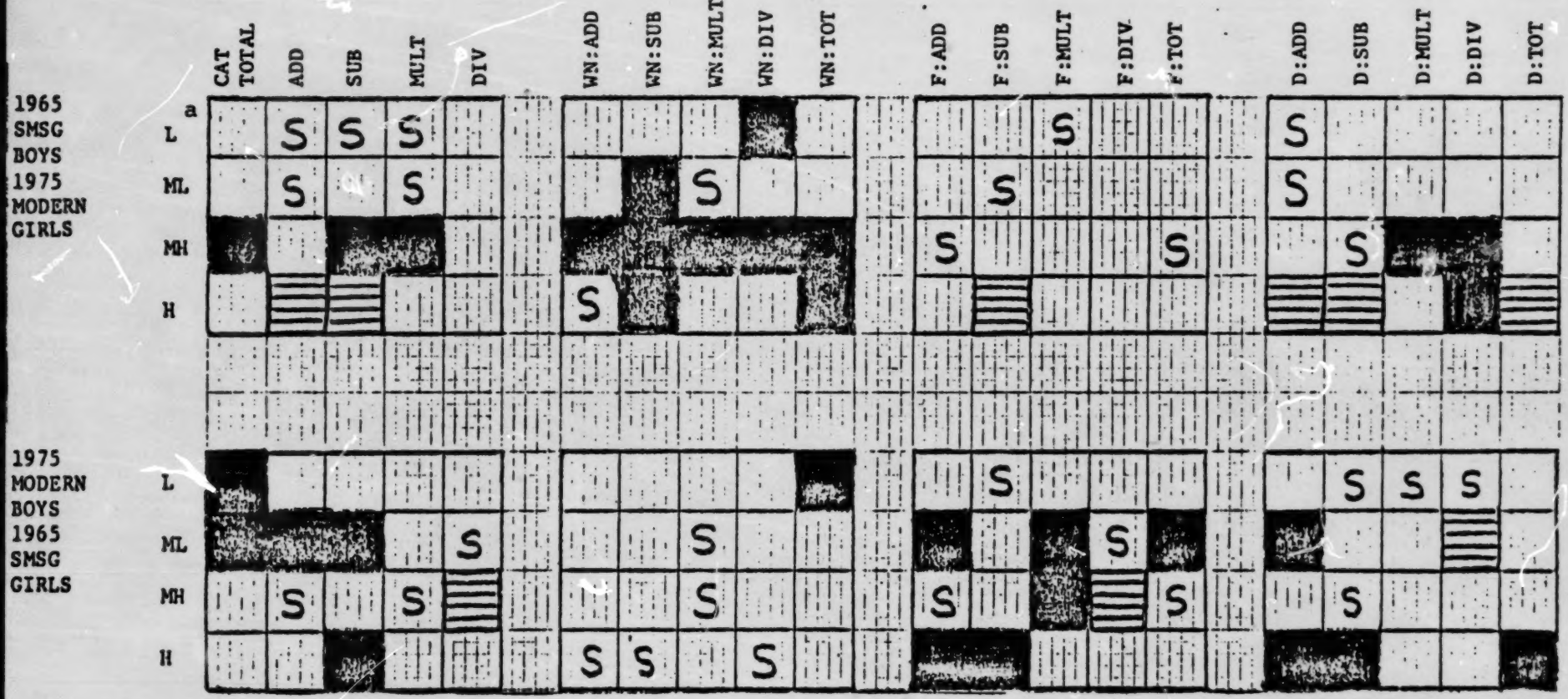
Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
TM	OldS-V	8.00	2.58					
SF	(18)	9.64	2.40	-1.64	11.26	.0011*	.97014*	1.2838*
SMSG/Traditional								
Low IQ								
SM	NSP	5.74	2.40					
TF	(23)	3.92	1.62	1.83	6.13	.0166*	1.4810*	1.9728
Midlow IQ								
SM	CCMT:T	12.97	3.24					
TF	(42)	9.33	3.21	3.64	21.11	.0000*	1.5819*	2.1019*
SM	NSP	6.22	2.35					
TF	(23)	3.77	2.06	2.45	20.09	.0000*	1.0915*	1.4502*
SM	NewS-V	6.46	2.33					
TF	(24)	4.17	2.34	2.29	16.02	.0002*	1.1440*	1.5201*
SM	OldS-V	6.51	1.85					
TF	(18)	5.17	1.86	1.35	8.74	.0043*	.90966*	1.2087*
Midhigh IQ								
SM	CCMT:T	15.48	4.56					
TF	(42)	11.10	2.77	4.38	19.57	.0000*	1.9833*	2.6400*
SM	Geom	2.03	1.15					
TF	(5)	1.34	1.11	.69	5.40	.0238*	.59451*	.79135
SM	NSP	8.03	3.02					
TF	(23)	5.10	2.26	2.93	17.54	.0001*	1.4019*	1.8660*
SM	NewS-V	7.69	2.70					
TF	(24)	4.83	2.33	2.86	18.67	.0001*	1.3271*	1.7664*
SM	OldS-V	7.79	2.72					
TF	(18)	6.28	1.83	1.52	6.22	.0156*	1.2187*	1.6223
High IQ								
SM	CCMT:T	20.58	5.15					
TF	(42)	13.28	3.99	7.31	64.88	.0000*	1.7995*	2.3817*
SM	NB10	2.00	.85					
TF	(3)	1.31	.84	.69	16.65	.0001*	.33314*	.44092*
SM	Geom	2.54	.90					
TF	(5)	1.70	.96	.84	20.47	.0000*	.36747*	.48636*
SM	NSP	10.98	3.01					
TF	(23)	5.74	2.72	5.24	85.11	.0000*	1.1266*	1.4911*

Table 5 cont.

Group	Variable Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
SM	Graphs	2.69	.51					
TF	(3)	2.44	.57	.24	5.06	.0266*	.21429*	.28362
SM	NewS-V	10.67	3.15					
TF	(24)	5.35	2.78	5.31	81.85	.0000*	1.1655*	1.5426*
SM	OldS-V	9.92	2.82					
	(18)	7.96	2.13	1.95	15.81	.0001*	.97490*	1.2903*

Table 6

SEX SUBGROUP COMPARISONS ACROSS PROGRAMS AND ACROSS YEARS (1965 SMSG AND 1975 MODERN, WITHIN SAME SCHOOL SYSTEM), AT FOUR I Q LEVELS, FOR 20 COMPUTATIONAL VARIABLES.



NOTE. Statistically significant difference favors Boys; Statistically significant difference favors Girls; Difference is not statistically significant; S Statistical significance .70 or higher; groups are extremely similar.

[a] LOW: I.Q. 91 or lower; MIDLOW: I.Q. 92 - 101; MIDHIGH: I.Q. 102-111; HIGH: I.Q. 112 or higher

Table 6 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
SMSG/Modern								
Low IQ								
SM	WN:D	4.51	2.42					
MF	(10)	5.59	2.22	-1.08	4.38	.0395*	1.0252*	1.3593
Midlow IQ								
SM	WN:S	5.16	1.59					
MF	(7)	5.98	1.22	- .82	8.24	.0051*	.56686*	.75100
Midhigh IQ								
SM	CAT:T	42.35	12.19					
MF	(80)	47.03	9.66	-4.69	3.95	.0499*	4.6853*	6.2061
SM	SUB	10.69	3.67					
MF	(20)	12.13	2.42	-1.44	5.00	.0279*	1.2776*	1.6924
SM	MULT	9.63	3.72					
MF	(20)	11.13	2.67	-1.51	4.90	.0294*	1.3521*	1.7909
SM	WN:A	5.90	1.45					
MF	(7)	6.60	.58	- .71	11.19	.0012*	.41971*	.55595*
SM	WN:S	5.48	1.70					
MF	(7)	6.48	.76	- .99	15.08	.0002*	.50821*	.67318*
SM	WN:M	5.90	2.27					
MF	(9)	7.63	1.08	-1.74	24.86	.0000*	.69271*	.91757*
SM	WN:D	6.34	1.99					
MF	(10)	7.43	1.52	-1.08	8.27	.00050*	.74891*	.99201*
SM	WN:T	23.62	5.67					
MF	(33)	28.14	2.73	-4.52	26.79	.0000*	1.7359*	2.2994*
SM	D:M	.59	.63					
MF	(2)	.86	.50	- .27	4.90	.0293*	.24304*	.32194
SM	D:D	.52	.63					
MF	(2)	.89	.74	- .37	5.43	.0220*	.31686*	.41971
High IQ								
SM	ADD	15.67	3.28					
MF	(20)	14.25	2.82	1.42	5.26	.0241*	1.2310*	1.6300
SM	SUB	14.81	3.53					
MF	(20)	13.41	2.55	1.40	5.06	.0267*	1.2389*	1.6404
SM	WN:S	5.92	1.30					
MF	(7)	6.51	.74	- .59	7.66	.0068*	.42569*	.56363*

Table 6 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
SM	WN:T	27.42	4.18					
MF	(33)	28.90	2.28	-1.48	4.71	.0324*	1.3544*	1.7933
SM	F:S	5.41	1.51					
MF	(7)	4.78	1.37	.64	4.78	.0313*	.58233*	.77104
SM	D:A	1.06	.89					
MF	(2)	.49	.71	.57	12.37	.0007	.32321*	.42795*
SM	D:S	1.04	.82					
MF	(2)	.43	.71	.61	15.49	.0002*	.30931*	.40954*
SM	D:D	.67	.63					
MF	(2)	1.00	.82	- .33	5.05	.0269*	.29443*	.38984
SM	D:T	3.71	1.88					
MF	(8)	2.80	1.93	.91	5.58	.0202*	.76705*	1.0156
Modern/SMSG								
Low IQ								
MM	CAT:T	30.75	9.88					
SF	(80)	35.30	7.97	-4.55	4.39	.0399*	4.3376*	5.7615
MM	WN:T	20.31	5.18					
SF	(33)	22.82	4.50	-2.5126	4.59	.0358*	2.3408*	3.1092
Midlow IQ								
MM	CAT:T	39.00	8.23					
SF	(80)	44.38	10.86	-5.38	5.50	.0219*	4.5786*	6.0807
MM	ADD	10.61	2.64					
SF	(20)	12.82	3.49	-2.21	8.99	.0038*	1.4725*	1.9556*
MM	SUB	10.13	2.53					
SF	(20)	12.06	3.43	-1.92	7.16	.0093*	1.4318*	1.9015*
MM	F:A	2.69	1.74					
SF	(7)	4.18	2.15	-1.48	10.10	.0022*	.93056*	1.2358*
MM	F:MULT	1.83	1.38					
SF	(8)	2.79	2.25	- .96	4.68	.0340*	.88629*	1.1770
MM	F:T	9.67	3.94					
SF	(30)	13.09	6.05	-3.42	7.95	.0063*	2.4214*	3.2157*
MM	D:A	.36	.64					
SF	(2)	.79	.77	- .43	6.58	.0125*	.33676*	.44723
MM	D:D	.78	.76					
SF	(2)	.44	.61	.34	4.13	.0460*	.33044*	.43884

Table 6 cont.

Group	Variable, Item N	Mean	S.D.	Diff.	F	Sig.	Scheffe 9500	Scheffe 9900
Midhigh IQ								
MM	DIV	10.20	2.99					
SF	(20)	8.39	2.67	1.81	7.61	.0070*	1.3038*	1.7270*
MM	F:M	1.95	1.63					
SF	(8)	2.82	2.17	- .87	4.25	.0421*	.83673*	1.1083
MM	F:D	2.55	1.91					
SF	(8)	1.57	1.29	.98	6.07	.0156*	.78645*	1.0417
High IQ								
MM	SUB	13.35	3.43					
SF	(20)	15.34	3.50	-1.99	8.14	.0053*	1.3856*	1.8344*
MM	F:A	5.00	1.96					
SF	(7)	5.72	1.45	- .72	4.37	.0391*	.68042*	.90077
MM	F:S	4.70	1.76					
SF	(7)	5.68	1.64	- .98	8.27	.0049*	.67864*	.89842*
MM	D:A	.57	.83					
SF	(2)	1.06	.84	- .49	8.47	.0045*	.33520*	.44375*
MM	D:S	.41	.50					
SF	(2)	.92	.83	- .51	13.34	.0004*	.27795*	.36797*
MM	D:T	2.52	2.07					
SF	(8)	3.55	1.96	-1.03	6.40	.0130*	.80463*	1.0652